



SOLID STATE NOISE SOURCES

DATA SHEET
NM - 101B

MICROWAVE SEMICONDUCTOR CORP.

MSC

100 School House Road
Somerset N.J. 08873
(201) 469-3311
TWX (710) 480-4730
TELEX 833473

Issue NOVEMBER 1980

Product Description

Solid State Noise Sources are another product of MSC's advanced semiconductor technology in the microwave frequencies. The noise sources' hybrid integrated circuit construction yields a mechanical integrity that enables them to withstand the most severe environmental conditions with high reliability and long-term stability.

Solid State Noise Sources are available with excess noise ratios of 15.5 dB as direct replacements for gas discharge tube noise sources. Sources with higher level excess noise ratio allow noise to be injected into receiver front-ends via a directional coupler. Signal generator replacement noise sources are available with output levels of -72 dBm/MHz.

"The Noisemakers."

Simpler, yet more reliable, calibration devices that only the high-technology resources of MSC could make possible.

Features

- Long term stability
- Extreme temperature stability
- Modest power requirements
- Fast switching capability
- Withstands high incident power
- No damaging spike leakage
- Wide bandwidth

Applications

- Automatic noise figure measurements
- Built-in test equipment ("BITE")
- Communications receiver measurements
- Laboratory standards
- Production testing
- Radar receiver measurements
- Radiometer reference sources

General Operating Characteristics

Operating Temperature	-55° to +100°C
Storage Temperature	-70° to +150°C
Temperature Sensitivity	<.01 dB/°C
Voltage Sensitivity	0.1 dB/%△
Current Sensitivity	0.03 dB/%△
Switching Speed	<1.0 μsecond
Maximum Incident Power	(With P or PA Option) ... 1.0 Watt CW
Maximum Incident Power	(Without Option) ... 0.25 Watt CW

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Printed in U.S.A.

Specifications subject to change without notice

Wideband Coaxial Sources - 1 MHz to 18 GHz

MODEL	FREQUENCY RANGE	ENR	FLATNESS	POWER REQ. MAX	BODY STYLE
MC 200	1 MHz to 500 MHz	42 dB	± 1.50 dB	+24V, 1mA	A
MC 201	1 MHz to 500 MHz	42 dB	± 1.50 dB	+12V, 1mA	A
MC 1000	10 MHz to 1.5 GHz	35 dB	± 0.50 dB	+28V, 10mA	B-C
MC 1100	10 MHz to 1.5 GHz	15.5 dB	± 0.50 dB	+28V, 10mA	E
MC 1040	10 MHz to 4.0 GHz	25.5 dB	± 0.50 dB	+28V, 15mA	E
MC 5112	1.0 GHz to 12.4 GHz	25.5 dB	± 0.50 dB	+28V, 15mA	E
MC 5118	1.0 GHz to 18.0 GHz	25.5 dB	± 0.50 dB	+28V, 15mA	D
MC 50018	5 MHz to 18.0 GHz	25.5 dB	± 0.75 dB	+28V, 15mA	D

- ENR options available – Option P (15.5 dB ENR); Option PA (5.5 dB ENR).
- Example: MC 50018 noise source with 15.5 dB ENR becomes MC 50018P.
- Units with P or PA options have fired/unfired VSWR of 1.3:1 max.

Standard Band Coaxial Sources - 1 GHz to 26 GHz

MODEL	FREQUENCY RANGE	ENR	FLATNESS	POWER REQ. MAX	BODY STYLE
MC 5012	1.0 GHz to 2.0 GHz	30 dB	± 0.5 dB	+28V, 15mA	C-B
MC 5024	2.0 GHz to 4.0 GHz	30 dB	± 0.5 dB	+28V, 15mA	C-B
MC 5048	4.0 GHz to 8.0 GHz	30 dB	± 0.5 dB	+28V, 15mA	C-B
MC 5812	8.0 GHz to 12.4 GHz	30 dB	± 0.5 dB	+28V, 15mA	C-B
MC 51218	12.4 GHz to 18.0 GHz	28 dB	± 0.5 dB	+28V, 15mA	C
MC 51826	18.0 GHz to 26.0 GHz	25.5 dB	± 0.75 dB	+28V, 15mA	D

- ENR options available – Option P (15.5 dB ENR); Option PA (5.5 dB ENR)
- C-B body styles become D-E on units with P or PA options.

Waveguide Band Sources - Gas Tube Replacements - 4 GHz to 40 GHz

MODEL	FREQUENCY RANGE	ENR	FLATNESS	POWER REQ. MAX	OUTPUT MATES WITH
MC 5046W	3.95 GHz to 5.85 GHz	15.5 dB	± 0.5 dB	+28V, 15mA	UG-149A/U
MC 5068W	5.85 GHz to 8.20 GHz	15.5 dB	± 0.5 dB	+28V, 15mA	UG-344/U
MC 5812W	8.20 GHz to 12.4 GHz	15.5 dB	± 0.5 dB	+28V, 15mA	UG-39/U
MC 51218W	12.4 GHz to 18.0 GHz	15.0 dB	± 0.5 dB	+28V, 15mA	UG-419/U
MC 51826W	18.0 GHz to 26.5 GHz	25.0 dB	± 2.0 dB	+28V, 20mA	UG-595/U
MC 52640W	26.5 GHz to 40.0 GHz	23.0 dB	± 3.0 dB	+28V, 20mA	UG-599/U

Adaptors

MC 601A	ADAPTOR FOR HP 340 and HP 342 Series Automatic Noise Figure Meters
MC 602	ADAPTOR FOR AIL Model 74 Noise Figure Meter

HEWLETT
PACKARD

CERTIFICATE OF CONFORMANCE
FAR 52.246-15

I certify that on 10/14/87, the HEWLETT-PACKARD COMPANY furnished supplies or services called for by Contract No. N0429A-87-F-3670 via UPS on Bill of Lading 04039889 in accordance with all applicable requirements. I further certify that the supplies or services are of the quality specified and conform in all respects with the contract requirement, including specifications, drawings, preservation, packaging, packing, marking requirements, and physical item identification (part number), and are in the quantity shown on this or on the attached acceptance document.

Date of Execution: 10/14/87

Signature: Tony Betterant

Title: Material Handler

Quantity	Hewlett-Packard Product No.	& Name	Serial No.	HP Order No.
1	346A	NOISE SOURCE	2614A01072	242813630001 0601
1	346A	NOISE SOURCE	2614A01073	242813630001 0601
1	346A	NOISE SOURCE	2614A01075	242813630001 0601

Wideband Coaxial Sources - 1 MHz to 18 GHz

MODEL	FREQUENCY RANGE	ENR	FLATNESS	POWER REQ.	BODY
MC 200	1 MHz to 500 MHz	42 dB	+1.50 dB	100 mA	
MC 701	1 MHz to 1.5 GHz	40 dB	+0.50 dB	120 mA	
MC 1005	10 MHz to 1.5 GHz	35 dB	+0.50 dB	120 mA	HEMTT
MC 1000	10 MHz to 1.5 GHz	35.5 dB	+0.50 dB	100 mA	PACKARD
MC 1040	10 MHz to 4.0 GHz	26.5 dB	+0.50 dB	150 mA	
MC 5112	1.0 GHz to 12.4 GHz	25.5 dB	+0.50 dB	150 mA	
MC 5118	1.0 GHz to 18.0 GHz	25.5 dB	+0.50 dB	150 mA	
MC 50018	5 MHz to 18.0 GHz	25.5 dB	+0.50 dB	150 mA	

CERTIFICATE OF CONFORMANCE D-98-125

SAF 25 SEP 1982

I certify that on 10/14/82, the HEMTT-PACKARD COMPANY furnished
samples of selected cataloged models No. N045A-A-B2-E-3820 A19
to BII of model 04038882 in accordance with the
specifications listed below. I further certify that the samples
are representative of the design specification and catalog in all respects.
The contract number, model number, and quantity of
the quantities delivered, packed, and shipped
item designated (part number), and the quantity shown on
this or on the attached acceptance document.

MODEL	FREQUENCY RANGE	ENR	FLATNESS	MAX	MIN
MC 5012	1.0 GHz to 10.0 GHz	25.5 dB	+0.50 dB	150 mA	
MC 5024	1.0 GHz to 12.4 GHz	25.5 dB	+0.50 dB	150 mA	
MC 5026	1.0 GHz to 18.0 GHz	25.5 dB	+0.50 dB	150 mA	
MC 5012	8.0 GHz to 12.4 GHz	25.5 dB	+0.50 dB	150 mA	
MC 5112	2.0 GHz to 12.4 GHz	25.5 dB	+0.50 dB	150 mA	
MC 51026	18.0 GHz to 26.0 GHz	25.5 dB	+0.50 dB	150 mA	

Hemtt-Packard

Quality Product No. 4 Name

Serial No.

PA

Date

1982

Signature

TRITI

Title

Test

QA

Date

1982

Signature

TRITI

Title

QA

Date

1982

HEWLETT
PACKARD

CERTIFICATE OF TRACEABILITY

Your Order No. N0429A-87-F-3670

HP Order No. 242813630001 0601

Products, materials and parts furnished on this order have been provided in accordance with all specifications agreed to in your purchase order.

Hewlett-Packard's calibration measurements are traceable to the National Bureau of Standards to the extent allowed by the Bureau's calibrations facilities or to the calibration facilities of other international standards organization members.

10/14/57

Date

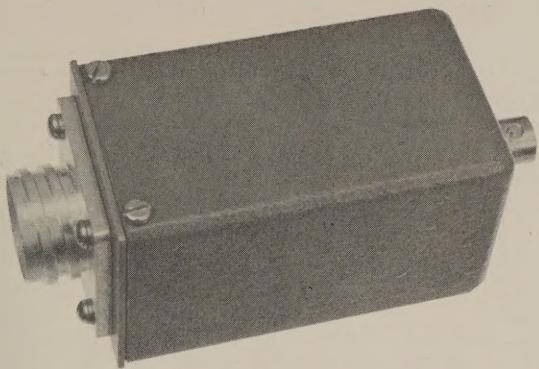
Douglas Betancourt
HEWLETT-PACKARD COMPANY

Quantity	Product No.	Description	Serial No.
1	346A	NOISE SOURCE	2614A01072
1	346A	NOISE SOURCE	2614A01073
1	346A	NOISE SOURCE	2614A01075



MICROWAVE SEMICONDUCTOR CORP.

16000 RIVER ROAD, SOMERSET, N.J. 08862, PHONE (201) 469-3311, TWX (201) 750-4710, TELETYPE



**MC 601A
NOISE FIGURE METER
ADAPTER**

**DATA SHEET
NM-105**

MICROWAVE SEMICONDUCTOR CORP.

MSC

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Issue November 1980

Product Description

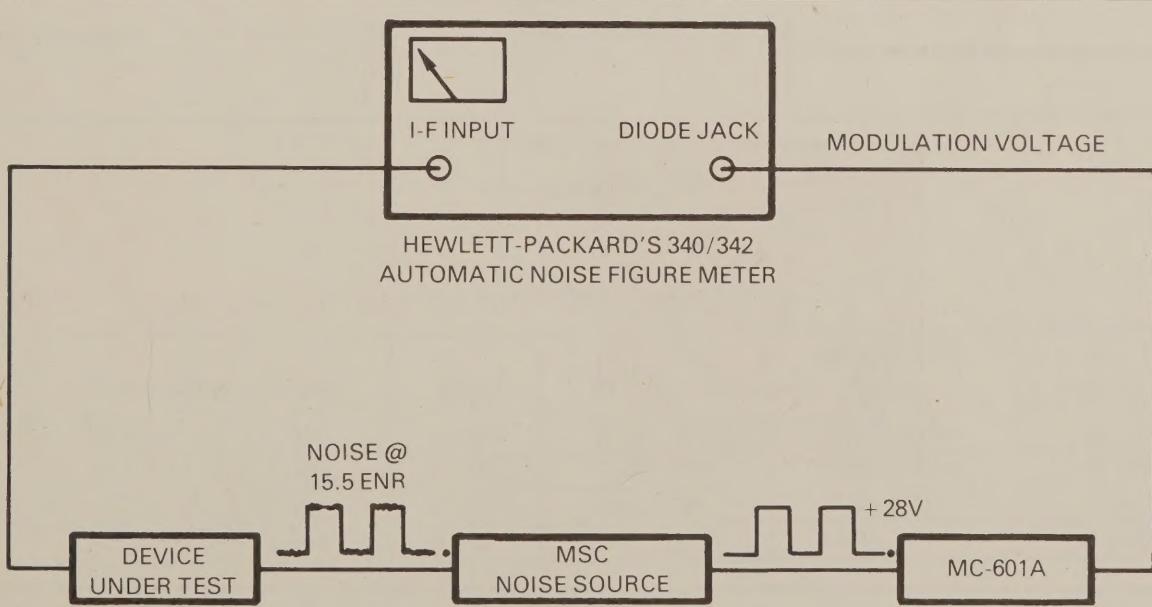
The MC 601A adaptor was designed to operate Microwave Semiconductor's Solid State Noise Sources with Hewlett-Packard's 340 and 342 series Automatic Noise Figure Meters. The noise sources are designed to operate from +28 volts (dc or pulsed). The MC 601A converts the modulation voltages present at the diode connector of the HP meter to a regulated +28 volt square wave. There is no current adjustment necessary as there is when the diode or gas tube sources are used. The current adjustment knob has no effect on voltage present at the output of the MC 601A and therefore no potential operator error.

Block Diagram

Operation

To operate the MC 601A with the HP 342, use the procedures outlined in Hewlett-Packard's 342 manual for automatic operation of gas tube noise sources except as follows:

1. Connect MC 601A to diode jack of HP 342 (located on lower right of front panel).
2. Connect Solid State Noise Source to MC 601A with convenient length of RG 58 cable or equivalent (up to 1000 feet).
3. Switch Noise Source Switch to Diode.
4. Switch Meter Function to Noise Figure.
5. Read noise figure on top scale of meter with the following correction: add to meter reading the following quantity ENR-15.2 where ENR is excess noise ratio of Microwave Semiconductor Noise Source.

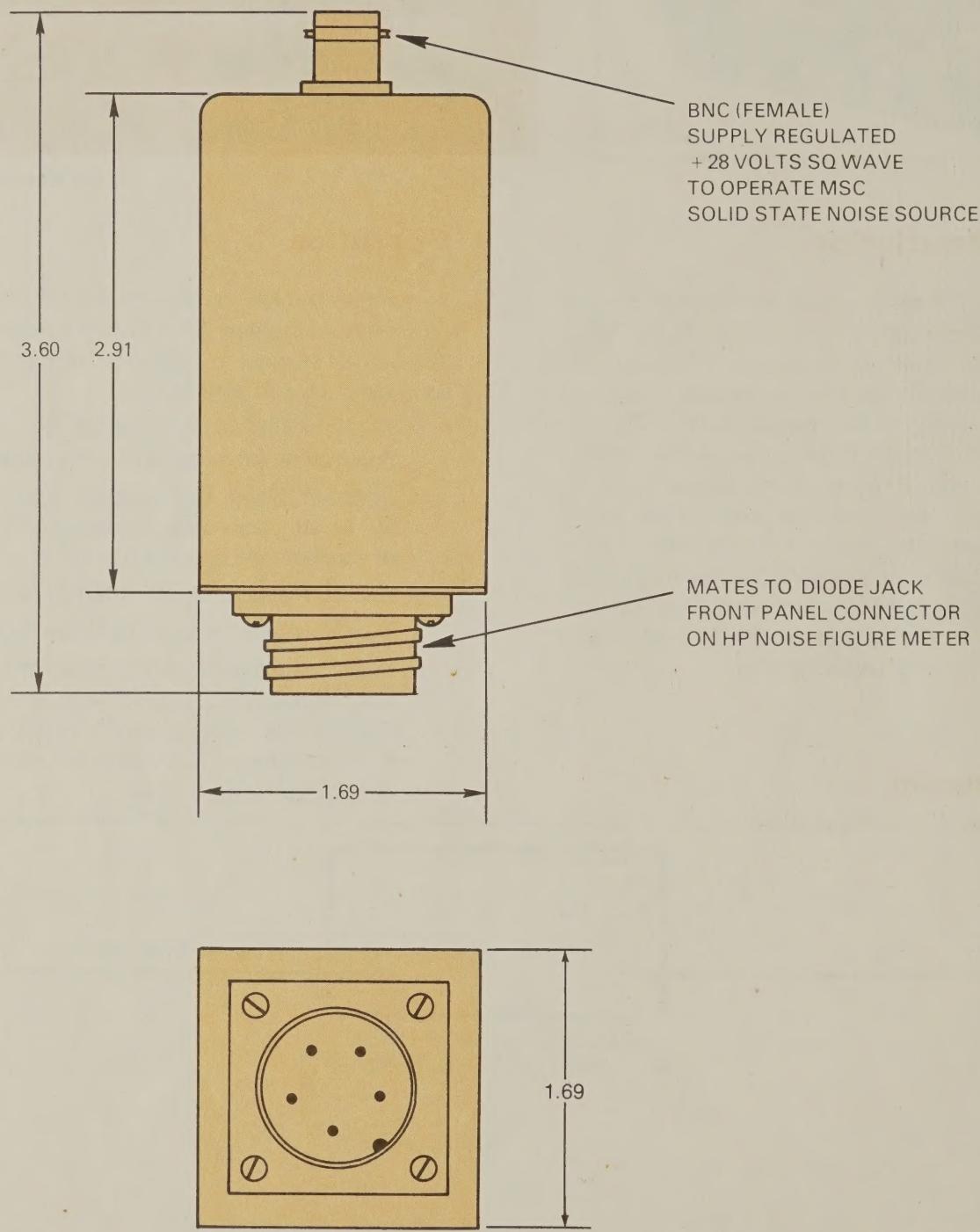


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Outline Drawing



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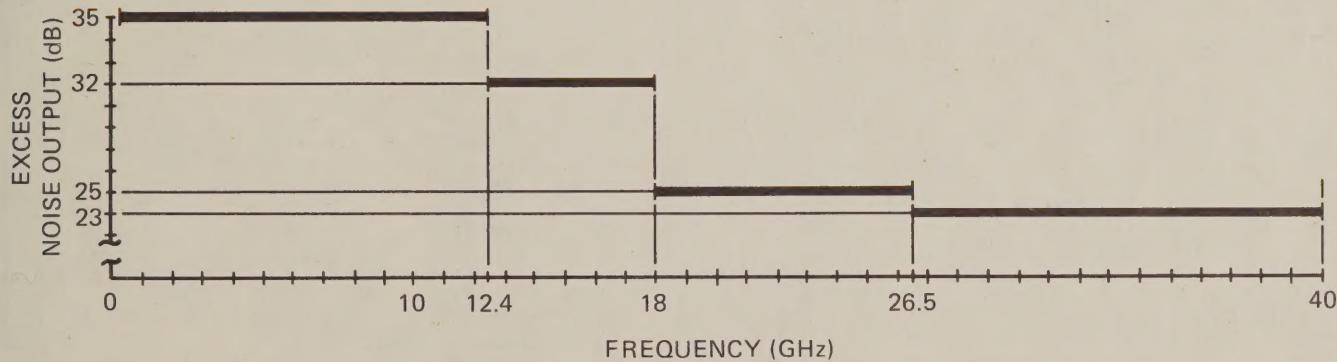
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System Noise Sources - Coaxial 10 MHz to 18 GHz

MODEL	TYPICAL SYSTEM APPLICATION	FREQUENCY RANGE	ENR	FLATNESS	POWER REQ. MAX	BODY STYLE
MC 7001	FM Broadcast	88-108 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7009	Land-Mobile	840-960 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7013	Military Radar	1215-1400 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7016	Telemetry/Satcom	1480-1720 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7023	Telecom/Telemetry	2100-2450 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7033	Military Radar	3100-3500 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7040	Satcom/Telecom	3700-4200 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7047	Military Radio	4400-5000 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7062	Terrestrial Microwave	5925-6425 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7077	Terrestrial Microwave	7125-8275 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7090	Military Radar	8325-9675 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C
MC 7100	Police/Weather Radar	9250-10750 MHz	35 dB	± 0.5 dB	+28V, 10mA	B-C

- 7000 Series is available over any 15% bandwidth from 10 MHz to 18 GHz
- The last three digits of the model number designate the center frequency in 100 MHz.
- The graph below displays available ENR of the standard system noise sources as a function of frequency.
- Standard models of the above system noise sources have high-level noise output for "BITE" system usage.
- ENR options available – Option P (15.0 dB ENR)
- Above 12.4 GHz, body style C is standard. All models are available with waveguide output.
- B-C body styles become E-D on units with P option.

System Noise Sources - Typical Noise Output



System Noise Sources - Waveguide 18 GHz to 40 GHz

MODEL	FREQUENCY RANGE	ENR	FLATNESS	POWER REQ. MAX	OUTPUT MATES WITH
MC 7215W	19.9 GHz to 23.1 GHz	25 dB	± 0.6 dB	+28V, 20mA	UG-595/U
MC 7300W	29.7 GHz to 30.3 GHz	23 dB	± 0.6 dB	+28V, 20mA	UG-599/U
MC 7315W	31.2 GHz to 31.8 GHz	23 dB	± 0.6 dB	+28V, 20mA	UG-599/U
MC 7350W	34.7 GHz to 35.3 GHz	23 dB	± 0.6 dB	+28V, 20mA	UG-599/U

- The graph above indicates available ENR as a function of frequency.
- 7000 series waveguide Noise Sources are available over any 15% bandwidth up to 21.5 GHz, above 21.5 GHz, bandwidth is 600 MHz.
- The last three digits, of the model number designate the center frequency in 100 MHz.
- Contact MSC for information on mechanical details.

OPERATION

Noise output is a function of diode current. For maximum stability with time and temperature, the noise sources should be operated from a constant current source (i.e., apply a constant current such that the voltage at the DC terminals of the noise source is +28 volts DC @ 25°C). DC voltage may be continuous or pulsed. MSC Solid State Noise Sources may be operated remote from associated test equipment.

OPTIONS

Custom options are available on some noise source types. Options include lower DC bias voltages, special DC bias connectors, custom packages, non-standard noise outputs/temperatures, and custom finishes. Units can be calibrated with directional couplers or isolators. Calibration data is supplied with each noise source. Contact MSC Sales and Technical Information Department for further information.

EXCESS NOISE RATIO (ENR, T_{ex})

A resistor will deliver to a matched load a noise power density of KTB where:

$$K = \text{Boltzmann's constant} = 1.38 \times 10^{-23} \text{ joules}/^{\circ}\text{K}$$

T = Physical temperature of resistor in $^{\circ}\text{K}$

B = Bandwidth in Hertz

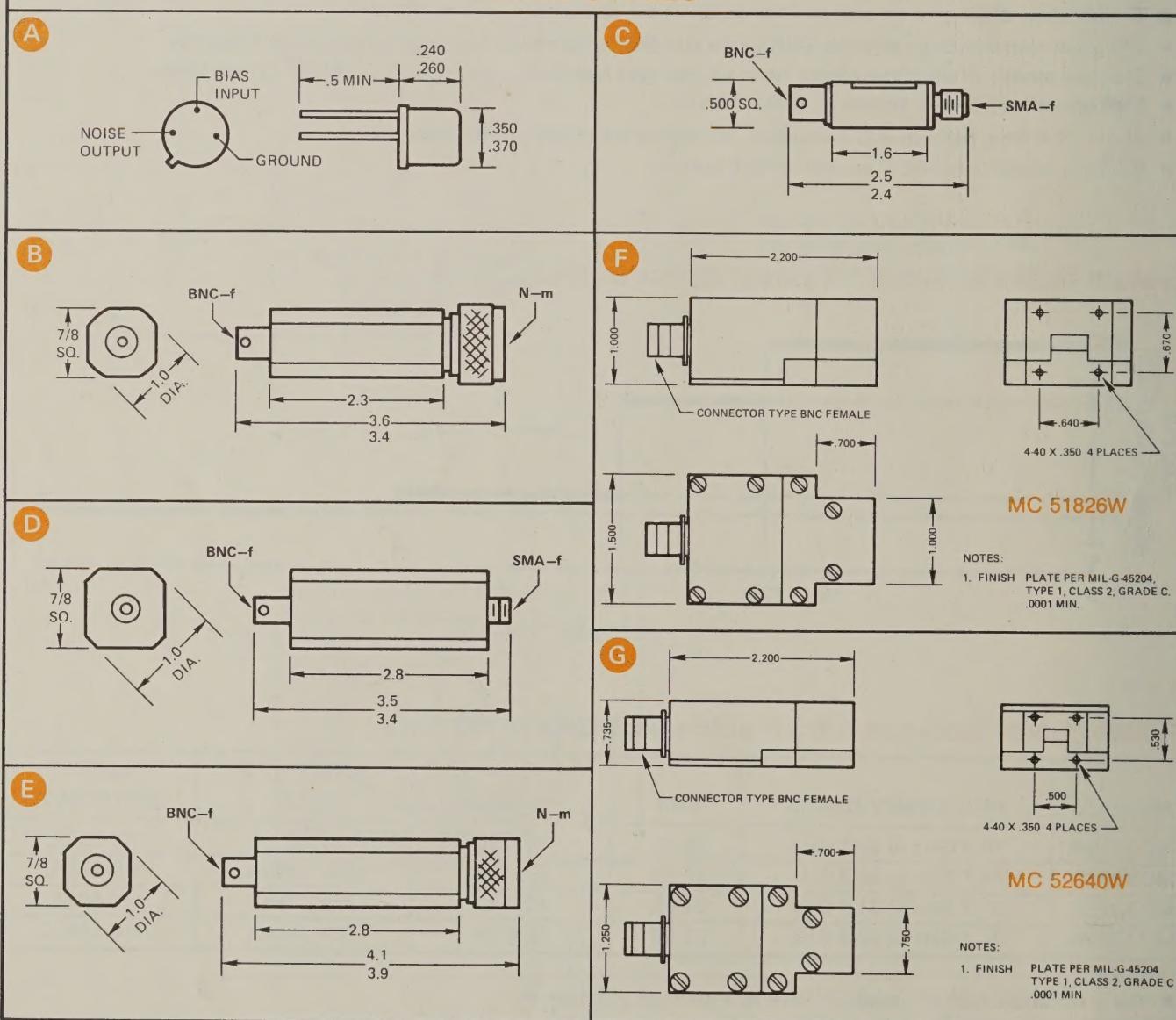
$$\text{Power}_{\text{Load}} = \text{KTB} \text{ (matched condition)}$$

At room temperature $T = 290^{\circ}\text{K}$, therefore

$$\text{Power}_{\text{Load}} = -114 \text{ dBm/MHz}$$

A noise source with an ENR of 30 dB (relative to KTB) has an output power of $\approx -114 \text{ dBm} + 30 \text{ dB}$ or -84 dBm/MHz and an effective temperature of $\approx 290,000^{\circ}$ Kelvin.

BODY STYLES



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